Wet Reflective Pavement Markings

ND 2010-01 Evaluation of Wet Reflective Elements for Pavement Markings

ND 2011-01 Evaluation of Grooved Pavement Markings

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ND 2010-01
Project Intent

- Incorporate 3M Wet Reflective Elements on a Project in ND.
- Use Conventional Striping Techniques used in North Dakota.
- Use 3M Materials on an Asphalt Surface and a Concrete Surface.

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ND 2010-01
Selected Projects

- IM-6-029(075)129
  - New Concrete Pavement
  - I-29 South of Grand Forks ND
  - RP 129 to RP 136

- SNH-6-002(079)337
  - New Asphalt Pavement
  - US 2 West of Grand Forks
    - RP 337 to RP 354

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IM-6-029(075)129
Design Details

- 14 Miles of Interstate
- North Bound and South Bound Roadway
- One Experimental Section and One Control Section in Each Direction.
- Edge-lines are Surface Applied High Build Water-based Paint
- Centerlines Are Grooved Tape
- Constructed on 2010

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IM-6-029(075)129 Performance

- Water-based markings have deteriorated more slowly than expected.
- Tape shows no visual signs of distress
- Performance is being evaluated objectively by retroreflectivity.

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IM-6-029(075)129 Performance (Cont.)

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IM-6-029(075)129 Retroreflectivity

- Retroreflectivity Readings were collected at each mile point throughout the project.
- Total of 6 Control Locations and 6 Experimental locations for each line type.

White Edge-line (Surface Applied Water-based Paint)								
	Dry (mcd/m^2/lux)				Wet (mcd/m^2/lux)			
Date Tested	NB Control	NB Test Section	SB Control	SB Test Section	NB Control	NB Test Section	SB Control	SB Test Section
11/3/2010 (Initial)	478	557	302	510	30	252	14	186
5/19/2011 (One Winter)	296	341	130	304	6	33	5	39

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IM-6-029(075)129 Retroreflectivity (Cont.)

Yellow Edge-line (Surface Applied Water-based Paint)								
	Dry (mcd/m^2/lux)				Wet (mcd/m^2/lux)			
Date Tested	NB Control	NB Test Section	SB Control	SB Test Section	NB Control	NB Test Section	SB Control	SB Test Section
10/13/2010 (Initial)	339	503	225	362	13	111	31	303
5/19/2011 (One Winter)	233	337	192	348	13	101	22	145

White Centerline (Grooved Tape)								
	Dry (mcd/m^2/lux)				Wet (mcd/m^2/lux)			
Date Tested	NB Control	NB Test Section	SB Control	SB Test Section	NB Control	NB Test Section	SB Control	SB Test Section
10/13/2010 (Initial)	832	766	338	302	66	406	46	376
5/19/2011 (One Winter)	1005	831	1000	1107	68	514	41	333

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SNH-6-002(079)337 Design Details

- 17 Miles of US 2
- West Bound Roadway
- Edge-lines and Centerlines are Water-based Paint
- Constructed on 2011

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SNH-6-002(079)337
Initial Retroreflectivity

- Retroreflectivity Readings were collected selected mile points throughout the project.
- Total of 6 Control Locations and 6 Experimental locations for each line type.

White Edge-line (Surface Applied Water-based Paint)				
	Dry (mcd/m^2/lux)		Wet (mcd/m^2/lux)	
Date Tested	Control	Test Section	Control	Test Section
9/15/2011 (Initial)	357	452	33	356

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SNH-6-002(079)337
Initial Retroreflectivity

Yellow Edge-line (Surface Applied Water-based Paint)				
	Dry (mcd/m^2/lux)		Wet (mcd/m^2/lux)	
Date Tested	Control	Test Section	Control	Test Section
9/15/2011 (Initial)	265	372	18	247

White Centerline (Surface Applied Water-based Paint)				
	Dry (mcd/m^2/lux)		Wet (mcd/m^2/lux)	
Date Tested	Control	Test Section	Control	Test Section
9/15/2011 (Initial)	324	488	21	176

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ND 2010-01 Project Cost

Location	SNH-6-002(079)337		IM-6-029(075)129			
Marking Material	4 IN Paint		4 IN Paint		4 IN Tape	
Reflective Material	Standard Glass	3M Elements	Standard Glass	3M Elements	Standard Glass	3M Elements
Bid Price (per LF)	$0.09	$0.44	$0.19	$0.31	$3.28	$3.28
Quantity (LF)	79,297	169,417	88,749	82,952	9,833	9,833
Total Cost	$6,899	$73,696	$16,862	$25,715	$32,252	$32,252

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ND 2011-01
Project Intent

- Incorporate 3M Wet Reflective Elements on a project in ND.
- Use 3M materials in water-based paint and epoxy paint.
- Evaluate the effectiveness of placing 3M materials with liquid markings in a groove.

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ND 2011-01 Project Design

Pavement Marking Layout					
Segment	Location	Length (feet)	Type	Material	Groove Depth (mils)
1A	RP 136.888 to RP 138 (NB) RP 136.766 to RP 138 (SB)	5,872 (NB) 6,516 (SB)	White and Yellow Edge-line	Water Based Paint with Ordinary Glass Beads[2]	40 ±5
1B	RP 138 to RP 140 (NB&SB)	10,560	White and Yellow Edge-line	Water Based Paint with 3M AW Element Series 90	40 ±5
2A	RP 140 to RP 142 (NB&SB)	10,560	White and Yellow Edge-line	Epoxy with Ordinary Glass Beads[2]	40 ±5
2B	RP 142 to RP 144 (NB&SB)	10,560	White and Yellow Edge-line	Epoxy with 3M AW Element Series 70E	40 ±5
3A	RP 144 to RP 146 (NB&SB)	10,560	White and Yellow Edge-line	Epoxy with Ordinary Glass Beads[2]	N/A[1]
3B	RP 146 to RP 147.226 (NB&SB)	6,474	White and Yellow Edge-line	Epoxy with 3M AW Element Series 70E	N/A[1]
4	RP 136.888(NB)	250 ft (25 10’ skip lines)	Center-line	3M 380 AW-5 Preformed Patterned Tape	100 ±10

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Summary

- On all projects the 3M Markings perform better initially in both wet and dry conditions than conventional glass beads
- Only 1 of 3 projects has been through a winter.
- All 3 projects will continued to be monitored for 5 years or until the material is replaced.

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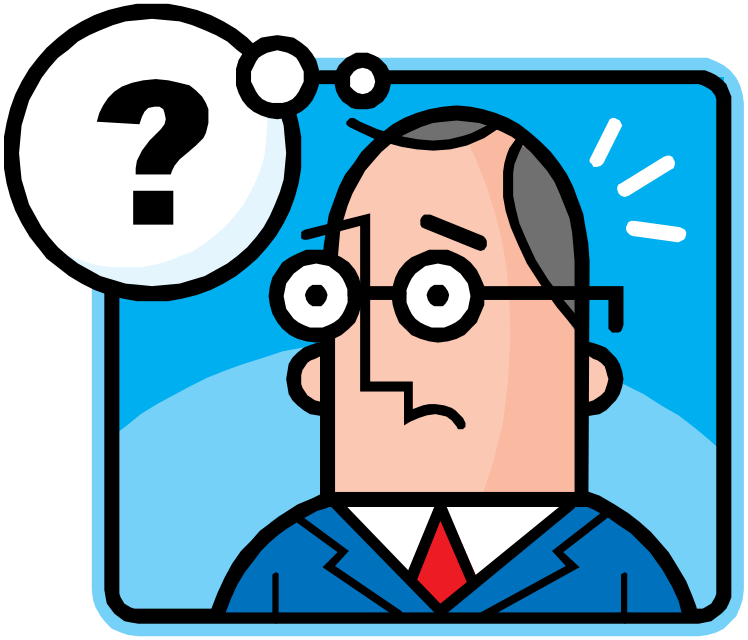
Questions/Comments/Discussion



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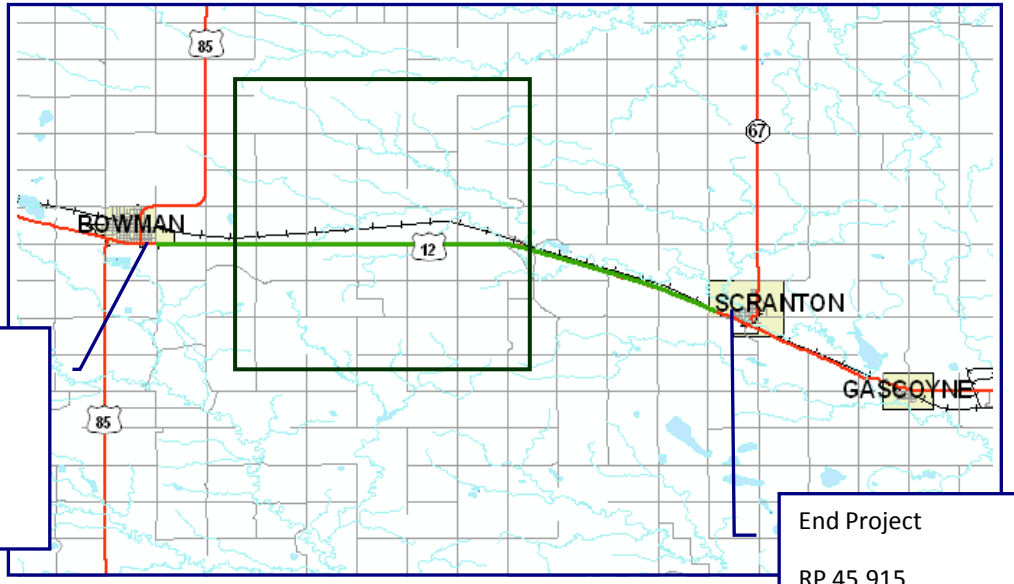
ND 04-01

Maximum Percentage of Asphalt Material in a Blended Base



Begin Project RP 34.191

Sta 1805+25

End Project

RP 45.915

Sta 2424+30

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ND 04-01 Performance

- Constructed on 2004
- 3 Test Segment: 60%, 70%, & 80% HBP.
- 1 Control Segment : 50% HBP
- Each Segment is ½ Mile Long
- Only Minor Distresses Have Been Observed
  - Rutting: 1/8" On All Segments
  - IRI: 35 to 45 On All Segments
  - Longitudinal Cracks: 5ft to 20ft in Length

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ND 04-01 Summary

- Current Data shows no difference in performance between any of the experimental segments and the control segment.
- This project will continue to be evaluated with a report produced biannually until 2015

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Questions?

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